EXHIBIT A

ENGINEERS EDGE
Solutions By Design

Application of Grease

[Lubrication Knowledge Menu] [Products and Services Directory]

Applications suitable for grease. Grease and oil are not interchangeable. Grease is used when it is not practical or convenient to use oil. The lubricant choice for a specific application is determined by matching the machinery design and operating conditions with desired lubricant characteristics. Grease is generally used for:

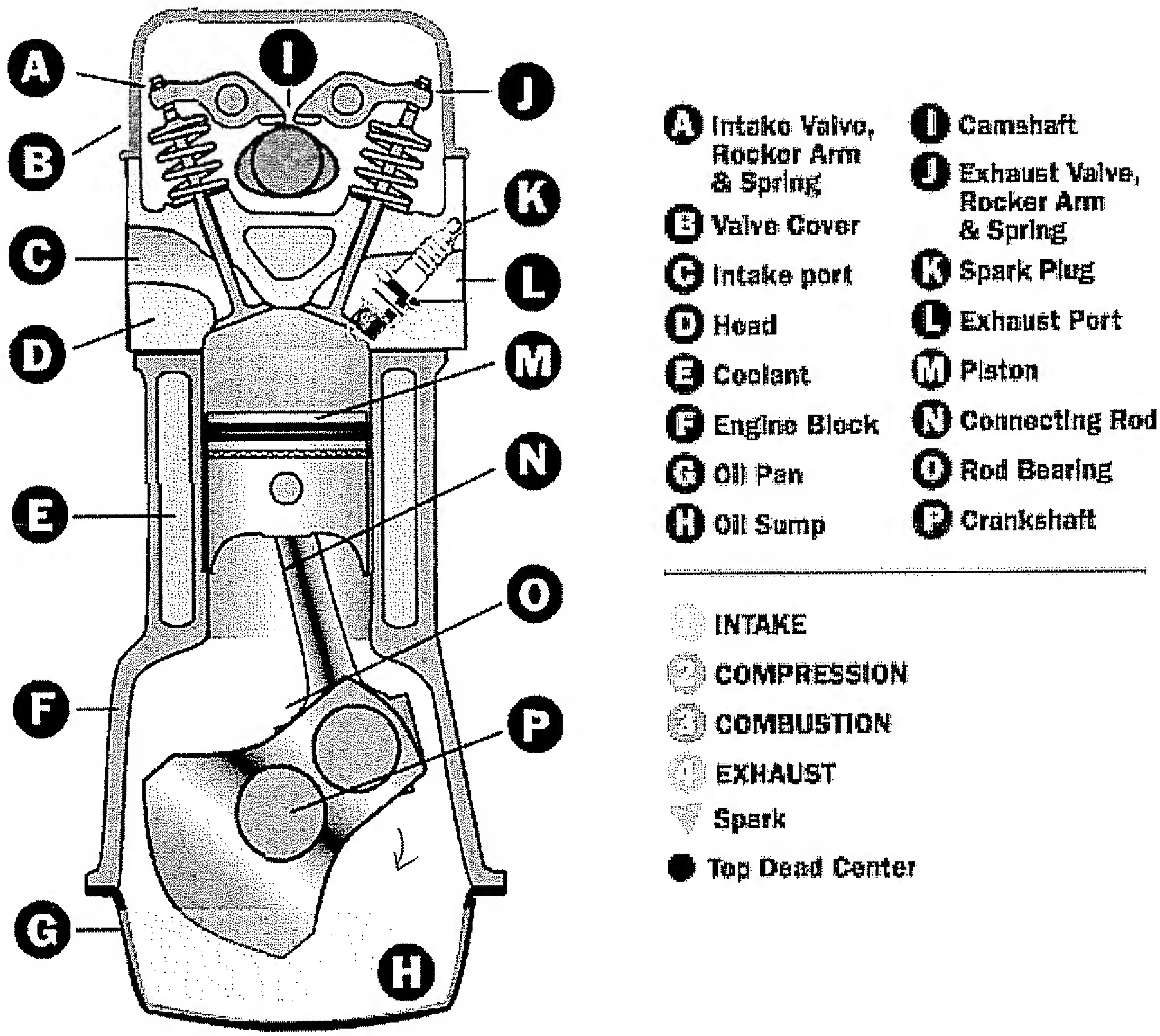
(1) Machinery that runs intermittently or is in storage for an extended period of time. Because grease remains in place, a lubricating film can instantly form.

(2) Machinery that is not easily accessible for frequent lubrication. High-quality greases can lubricate isolated or relatively inaccessible components for extended periods of time without frequent replenishing. These greases are also used in sealed-for-life applications such as some electrical motors and gearboxes.

(3) Machinery operating under extreme conditions such as high temperatures and pressures, shock loads, or slow speed under heavy load. Under these circumstances, grease provides thicker film cushions that are required to protect and adequately lubricate, whereas oil films can be too thin and can rupture.

(4) Worn components. Grease maintains thicker films in clearances enlarged by wear and can extend the life of worn parts that were previously oil lubricated. Thicker grease films also provide noise insulation.

EXHIBIT B



As piston (M) moves up & down in the cylinder, the crank shaft rotates through the oil in oil sump (H), thereby lubricating the crankshaft, connecting rods, & pistons. (see attached page 2 of 11).

Motor oil

From Wikipedia, the free encyclopedia
(Redirected from Engine oil)

Motor oil is a type of liquid oil used for lubrication by various kinds internal combustion engines. Other benefits from using motor oil include cooling by carrying heat away from moving engine parts and often include cleaning and corrosion inhibition in internal combustion engines. The major fraction of the majority of motor oils are derived from petroleum. Synthetic motor oil, consisting of artificially-synthesized compounds, currently has a minority share in the motor oil market place because it is more expensive, but offers enhanced performance.

Contents

Use of motor oil

Motor oil is used as a lubricant in various kinds of internal combustion engines in automobiles and other vehicles, boats, lawn mowers, trains, airplanes, etc. In engines there are contacting parts which move against each other at high speeds, often for prolonged periods of time. Such rubbing motion causes friction, absorbing otherwise useful power produced by the motor and converting the energy to useless heat. Friction also wears away the contacting surfaces of those parts, which could lead to lower efficiency and degradation of the motor. This also increases fuel consumption.

Lubricating oil makes a film between surfaces of parts moving against each other so as to minimize direct contact between them decreasing friction, wear, and production of excessive heat. Motor oil also carries away heat from moving parts, which is important because materials tend to become softer and less abrasion-resistant at high temperatures. Some engines have an additional oil cooler.

Coating metal parts with oil also keeps them from being exposed to oxygen, which inhibits their oxidation at elevated operating temperatures. Corrosion inhibitors may also be added to the motor oil. Many motor oils also have detergent additives to help keep the engine clean and minimize oil sludge buildup.

Rubbing of metal engine parts inevitably produces some microscopic metallic particles from the wearing of the surfaces. Sludge also accumulates in the engine. Such particles could circulate in the oil and grind against the moving parts, causing erosion and wear. Because undesired particles inevitably build up in the oil, in a vehicle engine the motor oil is circulated through an **oil filter** to remove harmful particles. An **oil pump**, a gear pump powered by the vehicle engine, pumps the oil through the oil filter. Oil filters can be a *full flow* or *bypass* type.

In the crankcase of a vehicle engine, motor oil lubricates rotating or sliding surfaces between the crankshaft journals, bearings, and rods connecting the pistons to the crankshaft. The oil collects in an **oil pan** at the bottom of the crankcase. In some small engines such as lawn mower engines , dippers on the bottoms of connecting rods dip into the oil at the bottom and splash it around the crankcase as needed to lubricate parts inside. In modern vehicle engines, the oil pump takes oil from the oil pan and sends it through the oil filter into oil galleries from which the oil lubricates the main bearings holding the crankshaft up at the main journals and camshaft bearings operating the valves. In typical modern vehicles, oil pressure-fed from the oil galleries to the main bearings enters holes in the main journals of the crankshaft. From these holes in the main journals, the oil moves through passageways inside the crankshaft to exit holes in the rod journals to lubricate the rod bearings and connecting rods. Some simpler designs relied on these rapidly moving parts to splash and lubricate the contacting surfaces between the piston rings and interior surfaces of the cylinders. However, in modern designs, there are also passageways through the rods which carry oil from the rod bearings to the rod-piston connections and lubricate the contacting surfaces between the piston rings and interior surfaces of the cylinders. This oil film also serves as a seal between the piston rings and cylinder walls to separate the combustion chamber in the cylinder head from the crankcase. The oil then drips back down into the oil pan. To see these details on a crankshaft, see "How Car Engines Work" (http://auto.howstuffworks.com/engine.htm) at HowStuffWorks or "Types of Lubricating Systems" (http://www.tpub.com/content/construction/14264/css/14264_242.htm) at Integrated Publishing.

Automatic transmission fluid is a separate fluid. It is typically colored red to distinguish it from the motor oil and other fluids in the vehicle.

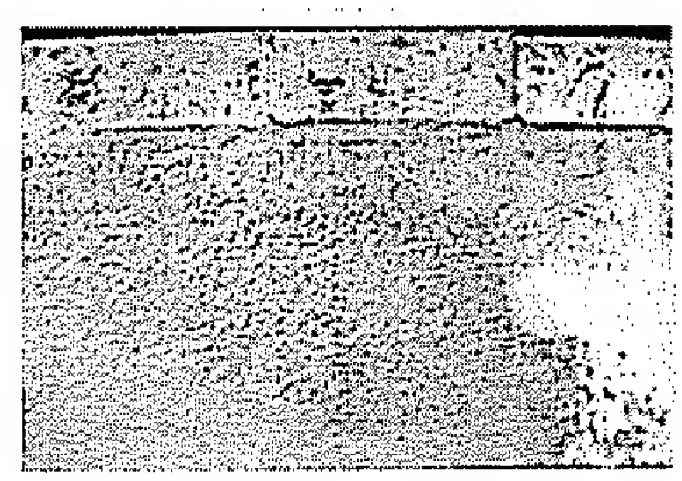
Non-vehicle motor oils

Other kinds of motors, such as internal combustion engines in motorcycles, mopeds, outboard motors (for boats), snowmobile, ATV's, personal watercraft, scooters, and go-carts, etc., also use motor oil, as well as engines that are not in vehicles such as those for electrical generators. Examples include 4-stroke or 4-cycle internal combustion engines such as those used in many lawn mowers and other engines, and special **2-cycle oil** used in 2-

stroke or 2-cycle internal combustion engines such as those used in various smaller engines like snow throwers (blowers), chain saws, toy engines like those in model airplanes, certain gardening equipment like weed/grass trimmers, leaf blowers, soil cultivaters, etc. Often, the applications are not exposed to as wide a temperature range in use as vehicles, so these oils may be single grade or have less viscosity index improver. 2-cycle oil is used differently than other motor oils in that it is pre-mixed with the gasoline or fuel, often in a gasoline : oil ratio of 50 : 1, and burned in use along with the gasoline.

In addition to the 2-cycle oil used if they have gasoline engines, chain saws also separately use "*bar and chain oil*" for lubricating the surfaces where the cutting chain moves around bar. Other examples of mechanical equipment often using oil include oil-driven compressors, vacuum pumps, diffusion pumps, sewing machines and other devices with motors, oil-driven hydraulic equipment, turbines, and mechanisms using gears such as gear differentials for rear wheel-drive vehicles. The oil properties will vary according to the needs of these devices.

Properties of motor oil



Spills of engine oil onto wet concrete create characteristic iridescent (rainbow-hued) stains — a thin layer of oil floats above the water.

Most motor oils are made from a heavier, thicker petroleum hydrocarbon base stock derived from crude oil, with additives added as needed to improve the properties. One of the most important properties of motor oil in maintaining a lubricating film between moving parts is its viscosity. In layman's terms, the viscosity of a liquid can be thought of as its "thickness" or a quantity of resistance to flow. The viscosity must be high enough to maintain a satisfactory lubricating film, but low enough that the oil can flow around the engine parts satisfactorily to keep them well coated under all conditions. The Viscosity Index is a measure of how much the oil's viscosity changes as temperature changes. A higher viscosity index indicates the '***viscosity***' changes less with temperature than a lower viscosity index.

Motor oil must be able to flow at cold winter temperatures to lubricate internal moving parts upon starting up the engine. Another important property of motor oil is its *pour point*, which is indicative of the lowest temperature at which the oil could still be poured satisfactorily. The lower the pour point temperature of the oil, the more desirable the oil is when starting up at cold temperature.

Oil is largely composed of hydrocarbons which can burn if ignited. Still another important property of motor oil is its flash point, the lowest temperature at which the oil gives off vapors which can ignite. It is dangerous for the oil in a motor to ignite and burn, so a high flash point is desirable. At a petroleum refinery, fractional distillation to separate crude oil fractions removes the volatile components, which more easily ignite, from the motor oil fraction; thereby increasing the oil's flash point.

Another test done on oil is to determine the Total Base Number (TBN), which is a measurement of the reserve alkalinity of an oil to neutralize acids. The resulting quantity is determined as mg KOH/(gram of lubricant). Analogously, Total Acid Number (TAN) is the measure of a lubricant's acidity. Other tests include zinc, phosphorus, or sulfur content, and testing for excessive foaming.

Different motor oils are sold for Diesel fuel engines, with many claimed to contain a higher level of detergents to keep fine combustion soot in suspension. However, for some brands only the packaging varies (the oil is the same), and in general a diesel engine can use any good quality oil of the correct grade.

Grades of motor oil

Single-grade motor oil

The Society of Automotive Engineers, usually abbreviated as **SAE**, has established a numerical code system for grading motor oils according to their **kinematic viscosity**. For single-grade oils, the kinematic viscosity is measured at a reference temperature of 100 °C (212 °F) in units of mm²/s or the equivalent older non-SI units, **centistokes** (abbreviated **cSt**). Based on the range of viscosity the oil falls in at that temperature, the oil is graded as an SAE number 0, 5, 10, 20, 30, 40, 50, 60 or 70. The higher the viscosity, the higher the SAE grade number is. These numbers are often referred to as the **weight** of a motor oil. The reference temperature is meant to approximate the operating temperature to which motor oil is exposed in an engine.

The viscosity of **single-grade** oil derived from petroleum unimproved with additives changes considerably with temperature. As the temperature increases, the viscosity of the oil decreases logarithmically in a relatively predictable manner. On single-grade oils, viscosity testing can be done at cold **winter (W)** temperature (as well as checking minimum viscosity at 100 °C or 212 °F) to grade an oil as SAE number 0W, 5W, 10W, 15W, 20W, or 25W. A single-grade oil graded at the hot temperature is expected to test into the corresponding grade at the winter temperature; i.e. a 10 grade oil should correspond to a 10W oil. For some applications, such as when the temperature ranges in use are not very wide, single-grade motor oil is satisfactory; for example, lawn mower engines.

Multi-grade motor oil

The temperature range the oil is exposed to in most vehicles can be wide, ranging from cold ambient temperatures in the winter before the vehicle is started up to hot operating temperatures when the vehicle is fully warmed up in hot summer weather. The difference in viscosities for any single-grade oil is too large between the extremes of temperature. To bring the difference in viscosities closer together, special polymer additives called **viscosity index improvers** are added to the oil. These additives make the oil a **multi-grade** motor oil. The viscosity of a multi-grade oil still varies logarithmically with temperature, but the slope representing the change is lessened. This slope representing the change with temperature depends on the nature and amount of the additives to the base oil.

The API/SAE designation for multi-grade oils includes two grade numbers; for example, **10W-30** designates a common multi-grade oil. The first number associated with the **W** is not rated at any single temperature. The "10W" means that this oil can be pumped by your engine as cold as a single-grade 10 weight oil can be pumped. "5W" can be pumped at a lower temperature than "10W". "0W" can be pumped at a lower temperature than "5W", and thins less at temperatures above 99°C (210°F). The second number, 30, means that the viscosity of this multi-grade oil at 100°C (212°F) operating temperature corresponds to the viscosity of a single-grade 30 oil at same

temperature. The governing SAE standard is called SAE J300. The motor oil grade and viscosity to be used in a given vehicle is specified by the manufacturer of the vehicle.

Some new vehicles are marked to use 0W25 oil. Some ultra fuel efficient and hybrid vehicles are marked to use 0W20 oil.

Common multi-grade oils

Some of the common multi-grade oils are:

- 0W-20
- 0W-30
- 0W-40
- 5W-20
- 5W-25
- 5W-30 Cooler climates, like Sweden or Canada
- 5W-40
- 10W-30
- 10W-40 Temperate climates, like England or the Eastern United States.
- 15W-40
- 15W-50 Hot climates, like Italy, Spain, Egypt
- 20W-40
- 20W-50

Turbine motor oil

Turbine motor oils are designed somewhat differently than reciprocating engine oils traditionally used in automobiles. Deposit control and corrosion are not significant issues when formulating a turbine oil, and the shear stresses that turbine oils are exposed to are minimal in light of the fact that turbines are naturally balanced rotating machines unlike reciprocating engines. Turbine oils tend to have the ISO VG range 32, 46, and 68 (cSt at 40°C), and make extensive use of polyolester, polyalphaolefin, and Group II as base stock due to the high temperatures they must endure.

In most aviation gas turbine applications, peak lubricant temperatures are not reached during engine operation, but after shutdown, when heat has been able to migrate from the combustor cans and the compressors into the regions of the engine with lubricated bearings and gearboxes. The gas flow associated with running the turbine provides significant convective cooling that disappears when the engine is shut down, leaving residual heat that causes temperatures within the turbine to rise dramatically, an often-misunderstood phenomenon.

American Petroleum Institute

Motor oil used for vehicle engines is commonly called **engine oil** in American Petroleum Institute (API) documentation. Engine oil is used for the lubrication, cooling, and cleaning of internal combustion engines. Motor

oil may be composed of a lubricant base stock only in the case of non-detergent oil, or a lubricant base stock plus additives to improve the oil's detergency, extreme pressure performance, and ability to inhibit corrosion of engine parts. Lubricant base stocks are categorized into five groups by the API. Group I base stocks are composed of fractionally distilled petroleum which is further refined with solvent extraction processes to improve certain properties such as oxidation resistance and to remove wax. Group II base stocks are composed of fractionally distilled petroleum that has been hydrocracked to further refine and purify it. Group III base stocks have similar characteristics to Group II base stocks, except that Group III base stocks have higher viscosity indexes. Group III base stocks are produced by further hydrocracking of Group II base stocks, or of hydroisomerized slack wax, (a byproduct of the dewaxing process). Group IV base stock are polyalphaolefins (PAOs). Group V is a catch all group for any other synthetic and mineral base stocks. Examples of group V base stocks include polyol esters, polyalkylene glycols (PAG oils), and perfluoropolyalkylethers (PFPAEs). Groups I, II, and III are sometimes referred to as mineral oils and groups IV and V as synthetic oils. However, some manufacturers (e.g., Castrol) have recently labeled their group III based oils as synthetic in the US, due to disputes over the definition of synthetic, and its application to motor oil.

Motor oils are further categorized by their API service class[1] (http://new.api.org/certifications/engineoil/categories/upload/ShelfCard_English.pdf). The API service classes have two general classifications: S for Service (typical passenger cars and light trucks using gasoline engines) and C for commercial applications (typical diesel equipment). The latest API service standard designation is SM for gasoline engines. The SM standard refers to a group of laboratory and engine tests, including the latest series for control of high-temperature deposits. Current API service categories include SM, SL and SJ for gasoline engines. All previous service designations are obsolete. There are six diesel engine service designations which are current: CI-4, CH-4, CG-4, CF-4, CF-2, and CF. All others are obsolete. It is possible for an oil to conform to both the gasoline and diesel standards. Engine oil which has been tested and meets the API standards has the API starburst symbol with the service designation on containers sold to oil users.

The International Lubricant Standardization and Approval Committee (ILSAC) also has standards for motor oil. Their latest standard, GF-4[2] (http://www.ilma.org/resources/ilsac_finalstd011404.pdf) was approved in 2004. A key test is the Sequence IIIG [3] (http://www.google.com/url?sa=U&start=4&q=http://corporate.lubrizol.com/PressRoom/MediaCoverage/pdflibrary/Jan05_LNG_Auto_Dept_I which involves running a 3.8L, GM 3.8L V-6 at 125 horsepower, 3600 rpm, and 150°C oil temperature for 100 hours. These are much more severe conditions than any passenger car would see. Street autos typically average a few dozen horsepower and 80°C. The IIIG test is about 50% more difficult [4] (http://www.astmtmc.cmu.edu/docs/gas/sequenceiii/procedure_and_ils/IIIG/Sequence%20IIIG%20Research%20Report%2002-24-04.pdf) than the previous IIIF test, used in GF-3 and API SL oils.

The ACEA A3/A5, and MB 229.5 tests used in Europe are even tougher, it is debatable whether this matters for normal drain intervals (5000-7000 miles). CEC (The Co-ordinating European Council) is the development body for fuel and lubricant testing in Europe and beyond, setting the standards via their European Industry groups; ACEA, ATIEL, ATC and CONCAWE.

Maintenance

In engines, there is inevitably some exposure of the oil to products of internal combustion, and microscopic coke particles from black soot accumulate in the oil during operation. Also the rubbing of metal engine parts inevitably produces some microscopic metallic particles from the wearing of the surfaces. Such particles could circulate in the oil and grind against the part surfaces causing erosion and wear. The oil filter removes many of the particles, but eventually the oil filter gets filled up. The motor oil and especially the additives also undergo thermal and mechanical degradation. For these reasons, the oil and the oil filter need to be periodically replaced.

The vehicle manufacturer specifies which grade of oil should be used for the vehicles it produces. The manufacturer also specifies how often the oil changes should be made. For example, most people in the United States believe that a common oil change frequency should be every 3000 miles or every 3 months, whichever comes sooner. This 3000 mile oil change interval has been relentlessly promoted by oil changing companies for decades. It had a scientific basis when engines used non-multi-weight, non-detergent oil. It no longer has any scientific basis, but it is still being promoted by certain entities, most notably the oil change industry in the United States (including car dealerships). Indeed, studies have shown more wear occurs with fresher (1000-2000 mile) oil. This is attributed to additives re-establishing themselves, TBN converging, and filters becoming more efficient. Most manufacturers recommend oil change intervals of 6,000 miles or more for modern cars. In Europe, by contrast, where the influence of oil companies has been much less, oil is typically changed only at a major service interval, between 10,000 and 15,000 miles for a modern car. For convenience, the oil filter is usually also replaced at the time the oil is changed. There are many types (or sizes) of oil filters for vehicle engines. Vendors of oil filters have information on which type of oil filter is compatible with a given vehicle.

When an engine is not running, the oil collects in an **oil pan** or **sump** at the bottom of the crankcase. There is an **oil drain plug** normally screwed into a drain hole at the bottom of the oil pan which is accessible from underneath the vehicle. To change the oil in a vehicle's engine, the drain plug is unscrewed to let the oil drain out of the oil pan. After the used oil drains out, the plug is screwed back into the drain hole. Some drain plugs have a replaceable washer to prevent leakage due to corrosion, rust or worn threads in the drain hole. The removable oil filter can be unscrewed at this time, often with the help of an oil filter removal tool, People who don't posses a filter removal tool, often like to use a screwdriver, which is pierced through the (thin) filter and then used as a lever, making it easy to unscrew the filter. (Some, however, oppose this practice, for the reason that if it should still prove impossible to remove the filter by these means, the car will have been immobilised as a result of piercing it.) Then a new oil filter screwed back in after applying fresh oil to the sealing surface of the new filter. Then new oil is poured in through an otherwise capped opening at the top of the engine. For many cars, 4 to 5 quarts or liters of oil are needed to fill the engine. In the engine, there is a removable **dipstick**, accessible from above the engine, to check the oil level while engine is not running. (In contrast, automatic transmission fluid level is checked with a separate dipstick while the engine is running.) Traditionally, lubrication at various joints in the vehicle is also done at the time of an oil change. Mechanics often call this maintenance routine "oil change and lube" or "LOF" (lube, oil, and filter).

Changing a vehicle's oil should lead to slightly improved fuel efficiency, lower temperature, and less wear since friction is reduced. Because changing a vehicle's oil could be messy and inconvenient for the owner since he/she must drain from under the vehicle, vehicle owners often have mechanics change the oil for them because they can

hydraulically lift the vehicle to easily access the oil pan. Many quick oil change shops have appeared in the USA to conveniently provide this service to owners. Many of these shops have rooms below ground level for a mechanic to access the underside of a vehicle. Used motor oil can be taken to recyling centers, auto parts stores and oil change locations for recycling. In addition, some states mandate that any location selling motor oil must also accept waste motor oil at no charge.

Other additives

In addition to the viscosity index improvers, motor oil manufacturers often include other additives such as detergents and dispersants to help keep the engine clean by minimizing sludge buildup, corrosion inhibitors, and alkaline additives to neutralize acidic oxidation products of the oil. Most commercial oils have a minimal amount of zinc dialkyldithiophosphate as an anti-wear additive to protect contacting metal surfaces with zinc and other compounds in case of metal to metal contact. The quantity of zinc dialkyldithiophosphate is limited to minimize adverse effect on catalytic converters.

There are other additives available commercially which can be added to the oil by the user for purported additional benefit. Some of these additives include:

- Zinc dialkyldithiophosphate (ZDDP) additives, which typically also contain calcium, are available to consumers for additional protection under extreme-pressure conditions or in heavy duty performance situations. ZDDP and calcium additives are also added to protect motor oil from oxidative breakdown and to prevent the formation of sludge and varnish deposits.

- In the 1980s and 1990s, additives with suspended PTFE particles were available to consumers to increase motor oil's ability to coat and protect metal surfaces. There is controversy as to the actual effectiveness of these products as they can solidify and clog the oil filters.

- Some molybdenum-containing additives to lubricating oils are claimed to reduce friction, bond to metal, or have anti-wear properties.

- Various other extreme-pressure additives and antiwear additives

Synthetic oil and synthetic blends

Synthetic lubricants were invented initially for high temperature gas turbine/jet engine applications where traditional mineral-derived lubricants provided inadequate performance. In the mid 1970s, synthetic motor oils were formulated and commercially applied for the first time in automotive applications. Improving the efficiency of lubricants, synthetic lubricants made wear and tear on gears far less than on the former petroleum based lubricants, reduced the incidence of oil oxidation and sludge formation, and allowed for extended drain intervals. Today, synthetic lubricants are used in modern day automobiles to lubricate nearly all lubricated components often with superior performance and longevity as compared to non-synthetic alternatives.

Instead of making motor oil with the conventional petroleum base, the molecules in the **synthetic oil** were

artificially synthesized **polyalpha-olefins**, which are polymers specially designed to have improved motor oil properties. These polymers are made by bonding together alpha-olefin monomers which provide numerous flexible branching groups on the polymer molecule's backbone. Because this side branching interferes with the ability of the molecules to line up compactly next to each other, the flexible molecules can slide past each other more easily and the synthetic oil has good flow ability even at low temperatures. The molecules could be made large enough and "softer" to retain good viscosity at higher temperatures, yet the side branching interferes with solidification and therefore allows flow at lower temperatures. Thus, although the viscosity still decreases as temperature increases, these synthetic motor oils have a much improved viscosity index over the traditional petroleum base. Their specially designed properties allow a wider temperature range at higher and lower temperatures and often include a lower pour point. Because the viscosity changes much less with temperature, these synthetic oils need little or no viscosity index improvers that are used with the traditional petroleum based oils. The viscosity index improvers are the oil components most vulnerable to thermal and mechanical degradation as the oil ages and wears out. Because these synthetic oils have little or no viscosity improver content, they do not degrade as quickly as traditional motor oils. However, they still fill up with particulate matter like the conventional oils do, so the oil filter still fills and clogs up with time and must still be changed periodically. Synthetic oil still needs to be changed periodically; but some synthetic oil suppliers suggest the intervals between oil changes can be longer, sometimes as long as 10,000 - 15,000 miles between oil changes. The same SAE system for designating motor oil viscosity applies to synthetic oils also.

Tests have shown that this fully true synthetic oil is superior to conventional oil in many respects, providing better engine protection, performance, and better flow in cold starts than petroleum-based motor oil. Until recently the price difference between petroleum and synthetic motor oils was significant, however with the recent rise in the cost of petroleum the gap is closing. Since some companies of synthetic oil warrant their oils for extended drain intervals, then in the majority of situations synthetic oil actually saves the end consumer more money. **Synthetic blend oil** is a blend of full synthetic oil and conventional petroleum-based oil, a compromise between full synthetic quality and economy. The cost is intermediate between full synthetic oil and conventional oil. The benefits of synthetic oil are at least partially provided at a lower cost per oil change to the consumer.

Future of motor oil

A motor lubricant made by a process that converts wax consisting of hydrocarbon molecules into an oil has been shown to last longer than existing engine oils. A problem with this process is the availability of the wax which is derived from natural gas through the Fischer-Tropsch process. In the United States, the process is too costly due to the high price of natural gas.

A process to break down polyethylene, a common plastic product found in many consumer containers, is used to make wax with the correct molecular properties for conversion into a lubricant, bypassing the expensive Fischer-Tropsch process. The plastic is melted then pumped into a furnace. The heat of the furnace breaks down the molecular chains of polyethylene into wax. Finally, the wax is subjected to a catalytic process that alters the wax's molecular structure leaving a clear oil. (Miller, *et al*, 2005)

Common points of discussion

Internet car forums have generated interest due to the great economic impact on the average household of automobile ownership. Inevitably in discussions on the maintenance of automobiles, motor oil can be a heated subject. From the perspective of overall motor vehicle ownership cost, it could be argued that a lesser attention to motor oil and a greater attention to other components of the vehicle drive train (such as transmission maintenance) is more logical; nevertheless a focus on motor oil is the norm. Within this discussion on motor oil in the internet community the following are key areas of controversy:

1. Synthetic oil versus conventional (aka "dino") oil vs. blends
2. Higher viscosity oil vs. modern low viscosity (5W-20) oil and engine wear
3. Oil analysis and its use for car maintenance by the average consumer
4. Factory "break-in oil" and when to do the first engine oil change
5. Following the vehicles oil life monitor for Oil Change Interval (OCI) vs. changing oil based upon a certain distance or time criteria. The patented GM OLM is especially sophisticated[5] (http://theoildrop.server101.com/ubb/ultimatebb.php?ubb=get_topic;f=1;t=010523;p=1), taking into consideration many factors that degrade crankcase oil. GM estimates millions of gallons of oil are saved each year by this computation. [6] (http://www.practicingoilanalysis.com/article_detail.asp?articleid=77&relatedbookgroup=Lubrication)

References

- Miller, S.J., N. Shan, and G.P. Huffman (2005). "Conversion of waste plastic to lubricating base oil". *Energy & Fuels* **In press**. DOI:S0887-0624(04)09696-3 10.1021/ef049696y S0887-0624(04)09696-3 (http://dx.doi.org/10.1021/ef049696y).

External links

- MotorOilWorld (http://www.motoroilworld.com/)
- The Engine Oil Bible (http://www.carbibles.com/engineoil_bible.html)
- Bob is the Oil Guy (http://www.bobistheoilguy.com/)
- More Than You Ever Wanted to Know About Motor Oil (http://www.micapeak.com/info/oiled.html)
- How to Change Car Oil (http://www.seepedia.com/car/howtochangeoil.html)
- Castrol Motor Oil (http://www.castrol.com/)
- CEC - The Co-ordinating European Council (http://www.cectests.org/)

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